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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/522,988

02/02/2005

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124-1104

4650

23117 7590 09/29/2008
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EXAMINER

KALAM, ABUL

ART UNIT

PAPER NUMBER

2814

MAIL DATE

DELIVERY MODE

09/29/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/522,988	Applicant(s) BARNES ET AL.	
	Examiner Abul Kalam	Art Unit 2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 September 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4 and 6-16 is/are pending in the application.
- 4a) Of the above claim(s) 3, 12, 13 and 16 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 2, 4, 6-11, 14 and 15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on July 8, 2008, has been entered.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. **Claims 1, 2, 4, 6-10, 14 and 15** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Scherer et al. (US 6,534,798**; previously cited, hereinafter Scherer) in view of **Samuel et al. (WO 00/70691**; cited by Applicant).

With respect to **claim 1**, Scherer teaches (**FIGS. 1-3**) an optoelectronic device comprising:

at least one layer (**12**) of semiconductor material (**col. 4: Ins. 40-67**) sandwiched between first and second electrodes (**18 and 22**), wherein at least one of the electrodes (**22**) is a thin, semitransparent metal (**col. 5: Ins. 27-40**).

said metal electrode **(22)** having two surfaces, at least one of the surface including a periodic microstructure **(FIG. 2; col. 5: Ins. 32-41)**, wherein the structure and positioning of the periodic microstructure is such that: surface plasmon (SP) polariton modes are supported mainly at an interface between the layer and the metal electrode, and are substantially scattered into propagating light, said propagation being out of the plane of the layer and the metal electrode **(col. 1: Ins. 57-67; col. 2, Ins. 1-5; col. 4: Ins. 23-39)**.

In Scherer's device, the periodic microstructures **(FIG. 2)** comprise a plurality of holes in the electrode layer, and thus, the electrode covers and separates a part of the layer and not the entire layer **(FIG. 7)**. Thus, Scherer teaches all the limitations of the claim with the exception of disclosing wherein said metal electrode is covering and separating said entire layer from air. However, Samuel discloses an analogous optoelectronic device wherein a metal electrode **(Fig. 2; pg. 18, Ins. 2-4)**, with a periodic microstructure grating, covers and separates the entire semiconductor layer **(Fig. 2; pg. 10, Ins. 16-27)**. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention, to incorporate the teaching of Samuel into the device of Scherer, such that the microstructured electrode layer is continuous and does not comprise any perforations **(pg. 10, Ins. 16-19)**, and thus, the electrode is able to completely cover, separate, and protect the semiconductor layer from the external environment. Furthermore, note that Applicant has not provided any unexpected or unpredictable results for the limitation of "covering and separating said entire layer from air."

With respect to **claim 2**, Scherer teaches the device according to claim 1, as set forth above wherein the periodic microstructure is a grating type structure present at the metal comprising electrode/air interface only (**col. 6: Ins. 44-59**).

With respect to **claim 4**, Scherer teaches the device according to claim 1, as set forth above, wherein the periodic microstructure is one of a periodic sequence of valleys and hills and a periodic sequence of grooves ("**one dimensional grating**," **col. 5: Ins. 32-41**).

With respect to **claim 6**, Scherer teaches the device according to claim 1, as set forth above, wherein the periodic microstructure is periodic in more than one direction on the surface ("**two dimensionally periodic structure**," **col. 1: Ins. 63-67; col. 2: Ins. 1-5**).

With respect to **claim 7**, Scherer teaches the device according to claim 1, as set forth above, wherein the periodic microstructures are sub-wavelength (**col. 8: Ins. 39-54; col. 16: Ins. 56-58**).

With respect to **claim 8**, Scherer does not disclose wherein the metal comprising electrode is an aluminum cathode. However, Samuel discloses wherein the metal comprising electrode is an aluminum cathode (**pg. 18, ln. 3; pg. 17, Ins. 23-25**). Also, note that aluminum is a well known conductive material, and typically used as an electrode in light emitting devices. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention, to modify the device of Scherer with the teaching of Samuel, because substituting aluminum for silver would have been considered a mere substitution of art recognized equivalents (MPEP 2144.06).

With respect to **claim 9**, Scherer teaches the device according to claim 1, as set forth above, wherein the device is a light emitting diode (**col. 1: Ins. 57-67**).

With respect to **claim 10**, Scherer does not disclose organic light emitting diodes. However, Samuel discloses wherein the light emitting diode is an organic light emitting diode (**Fig. 2; pg. 13, Ins. 4-12**). Also, note that organic light emitting diodes are well known and conventional in the art of semiconductor devices. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention, to modify the device of Scherer to form an organic light emitting diode, as taught by Samuel, because substituting organic diodes for inorganic diodes would have been considered a mere substitution of art recognized equivalents (MPEP 2144.06).

With respect to **claims 14 and 15**, Scherer teaches (**FIGS. 1-3**) an optoelectronic device comprising:

at least one layer (**12**) of semiconductor material (**col. 4: Ins. 40-67**) sandwiched between first and second electrodes (**18 and 22**), wherein at least one of the electrodes (**22**) is a thin, semitransparent metal (**col. 5: Ins. 27-40**), covering said layer (**FIG. 3**),

said metal electrode (**22**) having two surfaces, one of the two surfaces including a periodic microstructure (**FIG. 2; col. 5: Ins. 32-41**), wherein the structure and positioning of the periodic microstructure is such that: surface plasmon (SP) polariton modes are supported mainly at an interface between the layer and the metal electrode, and are substantially scattered into propagating light, said propagation being out of the

plane of the layer and the metal electrode (**col. 1: Ins. 57-67; col. 2, Ins. 1-5; col. 4: Ins. 23-39**).

In Scherer's device, the periodic microstructures (**FIG. 2**) comprise a plurality of holes in the electrode layer, and thus, the electrode covers a part of the layer and not the entire layer (**FIG. 7**). Thus, Scherer teaches all the limitations of the claim with the exception of disclosing wherein said metal electrode is covering and separating said entire layer from air. However, Samuel discloses an analogous optoelectronic device wherein a metal electrode (**Fig. 2; pg. 18, Ins. 2-4**), with a periodic microstructure grating, covers the entire semiconductor layer (**Fig. 2; pg. 10, Ins. 16-27**). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teaching of Samuel into the device of Scherer, such that the microstructured electrode layer is continuous and does not comprise any perforations (**pg. 10, Ins. 16-19**), and thus, the electrode is able to completely cover, separate, and protect the semiconductor layer from the external environment. Furthermore, note that Applicant has not provided any unexpected or unpredictable results for the limitation of "covering said entire layer."

3. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Arnold ('328)**.

With respect to **claim 11**, **Arnold** teaches (**Fig. 3**) an optoelectronic device comprising:

at least one layer **(19)** comprised of one of a dielectric and semiconductor material (**¶ [0022]**),

first and second electrodes **(18 and 30)**, said electrodes sandwiching the at least one layer **(19)**, wherein at least one of the electrodes **(30)** is a thin, semitransparent metal (**¶ [0022]**), covering said entire layer **(19, FIG. 3)**,

said metal electrode **(30)** having two surfaces, said metal electrode comprises a grating type structure on each of said two surfaces (**¶ [0025], [0027]**), wherein the structure and positioning of the periodic microstructure is such that: surface plasmon (SP) polariton modes are supported mainly at an interface between the layer and the metal electrode, and are substantially scattered into propagating light, said propagation being out of the plane of the layer and the metal electrode (**¶ [0027]**).

Thus, **Arnold** teaches all the limitations of the claim with the exception of explicitly disclosing wherein the microstructure of the two metal surface are out of phase by substantially π radians.

However, the limitation of “substantially π radians” does not lead to unexpected or unpredictable results, and thus, one of ordinary skill in the art would have been led to the recited dimensions through routine experimentation and optimization. Note, Applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears that the device would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are *prima facie* obvious, absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise

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critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966). See also MPEP 2144.04(IV)(B).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to form a microstructure with the claimed phase difference because, the dimension is not critical since it can be optimized during routine experimentation, depending upon the desired surface plasmon effect.

Response to Arguments

4. Applicant's arguments filed July 8, 2008, have been considered but are moot in view of new grounds of rejection.

Conclusion

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Abul Kalam whose telephone number is (571)272-8346. The examiner can normally be reached on Monday - Friday, 9 AM - 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M. Fahmy can be reached on 571-272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/A. K./
Examiner, Art Unit 2814

/Phat X. Cao/
Primary Examiner, Art Unit 2814